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AS PART OF A UNIVERSITY OF ROCHESTER EFFORT TO EXPLORE THE USE OF SELF INSTRUCTIONAL PROGRAMS AND MATERIALS IN EDUCATING DOCTORS, NURSES, PARAMEDICAL PERSONNEL, AND PATIENTS, THREE STUDIES OF PROGRAM UTILIZATION AND EFFECTIVENESS WERE MADE. DATA WERE OBTAINED ON COMPLETION AND NONCOMPLETION OF A PROGRAMED COURSE ON ALLERGIES, USER REACTIONS AS TO ITS USEFULNESS, AND ATTITUDES TOWARD THE USE OF MORE PROGRAMED MATERIALS. IN TWO STUDIES OF PROGRAMED INSTRUCTION IN CANCER DIAGNOSIS, TREATMENT, AND PATIENT MANAGEMENT, ACHIEVEMENT WAS MEASURED IN PROGRAMED AND CONVENTIONAL INSTRUCTION. IN THE ALLERGY PROGRAM, COURSE COMPLETIONS (87.5 PERCENT), POSITIVE REACTIONS (96 PERCENT), PERCEPTION OF PRACTICAL VALUE (93 PERCENT), AND FAVORABLE RESPONSES ON THE USE OF MORE PROGRAMED MATERIALS (95 PERCENT) INDICATED THAT EFFECTIVE PROGRAMED MATERIALS WOULD BE WELCOMED BY HEALTH PRACTITIONERS. IN THE CANCER PROGRAM, ACHIEVEMENT RESULTS SHOWED THAT PROGRAMED INSTRUCTION TAUGHT EFFECTIVELY AND IN A COMPARATIVELY SUPERIOR FASHION TO TRADITIONAL METHODS. (INCLUDED ARE FIVE TABLES, EIGHT REFERENCES, AND BACKGROUND DISCUSSION.) THIS PAPER WAS PRESENTED AT A NATIONAL SEMINAR ON ADULT EDUCATION RESEARCH (CHICAGO, FEBRUARY 11-13, 1968). (LY)

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RESEARCH ON THE USE OF PROGRAMMED INSTRUCTION AMONG ADULT LEARNERS IN PROFESSIONAL HEALTH FIELDS

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Historically it is fair to say that the primary concerns in adult education have followed a discernible path in dealing with instructional problems of greater complexity and with learners at higher levels of accomplishment. If there was never a time when an adult was presumed to be educated upon completion of college or other formal point of termination, and therefore not needing any adult education, it was at least generally assumed that his needs would be met by his own reading or activities.

In consequence of this attitude, the earliest efforts at some formalized system of adult education were aimed at illiterate, or functionally illiterate adults. Later, there were systematic efforts to up-grade the unskilled worker, to enhance the prospects of the blue collar worker, and now the attempt to reeducate the while collar worker displaced by technology and automation.

Meanwhile, the continuing education of the professional has all too frequently been left to the vagaries of happenstance. Reading, which is the backbone of continuing self-education, pales beside the geometric growth of knowledge in the professions--and the proliferation and sub-division of journals that carry materials. Lectures and speeches are notoriously inefficient methods of conveying information, let alone technique. And most professionals find themselves too pressed for time

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to lay their practice down and return to the academic environment for prolonged periods of time to "catch up".

Background to Health Problem

There are certain world wide socio-economic forces that are so powerful and transcending that they must alter the practices in continuing education for health care professionals.

There is the tremendous growth in population that challenges our very capacity to render quality health care. The same population growth coupled with the real advances made in treatment and prevention over the past decades has caused a dramatic shift in the needs for care--pediatrics and geriatrics are increasingly and simultaneously important as birth rate and life expectancy both increase. The population growth, too, simply widens the chasm between numbers of recipients and practitioners thus requiring a readjustment of traditional roles with the nurse being required to do more things that a doctor once did, and with other health specialists assuming responsibilities not heretofor demanded.

If the problems of population were not enough in themselves to challenge the fabric of health service and its educational system, then the increasing social expectation--demand even--for universal health care would certainly cause us to change our behaviors. As education increases, as the knowledge of comparative care spreads, and as governmental and private health insurance plans widen, then more care is required--certainly more efforts at health education and disease prevention--for the same population let alone a growing one.

Finally, health care like every other aspect of our society is feeling the impact of breakthroughs in science, improvements in communcation, enlargement of the technological base, and the effects of automated and highly sophisticated diagnostic and treatment systems. More diseases can be cured; more maladies can be detected in time to arrest them; and more people know of these advances and so demand them.

In short, these great opportunities for improving health conditions and health practice carry within themselves the need for changing the educational structure in order to fulfill the promises we possess.

Statement of the Problem

The problem can be succinctly stated. We need to train more health practitioners at the same time that we need to provide much greater continuing education opportunities to the current practitioners so that they can up-date their performance and assume enlarged responsibilities in their daily work.

In training these new and continuing groups, we must devise new methods and new procedures for instruction. One principal reason for this is that the most acute shortage in the health profession probably resides within the subset of health educators. In the United States of America, for example, it is estimated that there are over 7,000 hospitals, but that less than 200 of these have a qualified director of training for the semi-professional employees. The most chronic vacancies exist on the faculty seats of the schools of medicine and nursing. In short, we don't have enough teachers to do the job of continuing education by traditional methods, if the students had the time and the access--which they don't.

Given these parameters to the problem, it should be no surprise that in this country the health professions have been among the pioneers in development of the new technology of programmed learning and the adaptation of its approach to the teaching of health care subjects, techniques, and approaches.

Objectives of this Paper

Beginning in 1962, a series of studies was inaugurated at The University of Rochester to explore the applications of self-instructional programs and materials to the education of health principals--doctors, nurses, para-medical personnel, and patients. Of particular importance to this paper are a sub-group of these studies that deal with the adult professional learner using these programs for purposes of continuing education.

Specifically, we wish to report on three studies of program utilization and effectiveness. From these, and from an analysis of related research conducted at other institutions, we shall attempt to furnish viable generalizations that would seem to be applicable to the continuing education of health professional--and, by extension, to the continuing education of other professional groups.

Acceptance and Usage of Health Programs

While a number of our inquiries have concerned themselves with the acceptance of self-instructional materials by the professional, the most extensive study of this factor was done in connection with a program on <u>Allergy and Hypersensitivity</u>. It is unfortunately a truism that

the best methods may not always be ones that are acceptable to the recipient. And so, before we embarked on large-scale attempts to develop programs for health professionals we wanted some assurance that they would be used with some alacrity and with at least neutrality regarding their potential.

In the early spring of 1963, a golden opportunity presented itself. Pfizer Spectrum was releasing the aforementioned program of allergy, and we were able to have included in the mailing a reaction-naire card which identified the recipients by category and asked for open-ended responses to a number of significant questions relating to their feelings and judgments on the self-instructional material.

From the thousands of cards we received, we selected a sample of 5,517 replies and did a thorough analysis of the responses. In the tables below, we will present the gist of these replies, but it might be helpful to insert at this point some of the expectations that we felt prior to making the analysis.

First of all, we felt any indication that the physicians accept-ed programs equally well as traditional methods would be promising. At least, this would mean that we had a new, alternative tool that would be useful in continuing education. Second, we hoped to learn that at least one-third of the respondents had completed the material since this would represent a reasonable approximation to attendance at medical society lectures, random reading of journal articles, etc. Finally, we hoped that some percentage--perhaps as high as fifty--would like to receive other programmed materials in the future.

One of the first questions, then, was whether the adult, pro-fessional learner, in this case a medical practitioner, had in fact completed the material. The results are displayed in Table 1.

Table 1

Comparison of Completion and Non-Completion
of the Programmed Course on Allergy

Response by Practitioners	Number	Per Cent
Did complete course	4,826	87.5%
Did not complete course	481	8.7%
No recorded response	210	3.8%

If we were to partial out the no responses, it would raise the two other percentage figures, but if we were to lump the no response in with the non-completions, we would still have an overwhelming number of individuals who did complete this form of continuing education--a percentage far higher than we had hoped for in our most optimistic estimates. It is unnecessary, either, to stress the fact that a considerable number of "non-completion" replies indicated that they did plan on finishing the material soon.

A second area of concern dealt with their reactions to the material, both their generalized response of like or dislike and their particularized reaction to the question of usefulness. We asked them then to respond to two questions on whether they liked the material and whether it had practical value for them. The results are shown in Table 2.

Table 2

Reactions of Allergy Program Users Concerning
General and Practical Utility of Instruction

Response by Practitioners	Number	Per Cent
Definitely liked program	5,311	96.3%
Equivocal reaction	22	.4%
Did not like program	49	.9%
No reply	135	2.4%
Had definite practical value	5,140	93.2%
Equivocal reaction	130	2.4%
Had no practical value	73	1.3%
No reply	174	3.2%

Again, if we were to lump all equivocal, negative, and non-replies together, we would still have an overwhelming positive reaction to the use of self-instructional programming in continuing education. Not only did more than 96 per cent of the respondents like the material but over 93 per cent felt that it contained practical material of value in their own practice--which in some respects must be the final determination of the value of any continuing educational material.

The final question was whether the respondents would like to see more material in this form, and in Table 3 we can see a display of their reactions.

Table 3

Reactions Toward the Use of More Programmed Material Among Allergy Students

Response by Practitioners	Number	Per Cent
Definitely would like more	5,230	94.8%
Equivocal reply	18	.3%
Would not like more	26	.5%
No reply	243	4.4%

In this case, the correct reading of the responses would seem to be that less than 1 per cent of the users would actively dislike receiving any more instructional material in this form. Almost all of the practitioners, some indeed with reservations and criticism, desired more programs and a great number suggested one or more subjects for the next programmed sequence.

On the whole, then, we had ample assurance that effective programmed materials would be received positively by the health practitioner--certainly as well as traditional instruction and quite likely under even happier circumstances. We knew that practitioners liked the ability to regulate their own learning rates, adapt instruction to their own schedules, and benefit from the concise organization of the material around specific objectives. All of these factors combined to make the learning experience both effective and efficient.

Evaluation of Learning Achievement

While there were a number of research projects that indicated the usefulness of programmed learning materials for both medical (Lysaught, 1964) and nursing education (Craytor and Lysaught, 1964), we have been particularly concerned with the determination of learning achievement among adult professionals using short programmed sequences that were developed by health center faculty members. Our reason for concern about this is quite understandable.

Most of the departures and new advances in both medical research and practice emanate from the multi-faceted medical centers. The problem in continuing education is persistently how to get such advances and developments into the practical repertoir of the health worker in the field. If learning programs are an accepted means, and if they are an effective means, then it follows that we should learn whether the faculty members who know their subject matter and its advances can develop instructional materials to inform and empower their colleagues to use innovations in the practice of health care. If the answers are all in the affirmative, we have cut down materially on the cultural lag between innovation and application, and we have made it possible for the learner to receive his instruction from the most knowledgeable of the teachers.

Two particular studies may suffice to indicate our results. In both cases, faculty members of the School of Medicine and Dentistry at The University of Rochester, working with the assistance of programming specialists from the College of Education, developed programmed sequences that could teach unfolding discoveries about cancer diagnosis, treatment,

and patient management. One study involved medical learners; students, interns, residents, and practitioners. The other study involved nurse learners; students, graduate students, and practitioners. In discussing the results of these studies, we shall attempt to emphasize the point only that programming becomes a viable alternative to what we are doing in conventional learning, and thus affords us greater freedom of choice as we seek to improve continued education.

In the study on Cancer Teaching in Medicine, a series of units are under development designed to teach the learner the latest information on the development, classification, diagnosis, prognosis, and treatment of various cancers. The units include: general principles, cancer of the breast, polyps, cancer of the colon and rectum, cancer of the head and neck, etc. In these evaluations, we were concerned only with the determination of sheer achievement rather than a comparative achievement with control or conventional groups.

In Table 4, we see the results obtained in controlled testing of two medical programs for effectiveness. Both of these units represented approximately two and one-half hours of student learning time, and both involved advance concepts of diagnosis and patient management.

Table 4

Results of Achievement Testing on Two Learning Programs in Cancer Teaching for Medical Learners

Program	Mean Modified Gain Score
Polyps of the Colon and Rectum	50%
Cancer of the Colon and Rectum	65%

In discussing Table 4 it is essential to point out that the modified gain score (Mager, 1967) is an evaluative criterion that makes allowance for the entering level of knowledge, and is a more sensitive instrument than a simple gain score. Also, as a general rule of thumb, we find any modified gain score in excess of 50 per cent to be acceptable. We see, then, that the first completed program in the medical teaching of cancer, done by a medical center faculty member with the assistance of an educational specialist, met the minimal level of achievement performance while the second unit (with the experience of the first to aid in its completion) jumped to a 65 per cent modified gain score.

These data, however, unimpressive they may seem to the layman, strongly confirm our belief that health educators with some back-up assistance are capable of developing sound instructional materials that can go directly from them to the student--thus materially speeding up the elapsed time loss in transmission from research and discovery to practice. The cancer programs were found to be quite effective--and moreover were quite efficient in terms of both teacher and student time.

The third study related more directly to the question of comparative value in achievement level between programmed instruction and conventional forms of continuing education teaching--that is, lecture, discussion, etc. In this case, the subject matter again dealt with cancer and its treatment, but in this particular instance we were concerned with the nurse as the learner, and with the role of the nurse in patient management. We compared the use of the program with the effectiveness of a competent lecturer in a well-planned conventional classroom situation, and hoped to find, again, that the program would

do at least as well thus affording us a good alternative. The results of one aspect of our study are shown in Table 5.

Table 5

Comparison of Achievement Results Between Programmed and Conventional Instruction in Cancer Nursing

Groups	Achievement Test Scores	
	Mean	Median
1A Programmed Instruction	69.9	69.0
1B Conventional Instruction	62.8	64.0
2A Programmed Instruction	67.6	69.0
2B Conventional Instruction	61.9	61.0

When we combine the four groups into two treatment groups and conduct a test for the significance of difference between the means we find that the programmed groups achieved better at below the .001 level of significance. In other words, that the difference could be attributed to chance in only one case out of a thousand. It seems readily apparent that our teacher-constructed units for continuing education not only teach effectively (Table 4), but do so in comparatively superior fashion to traditional methods (Table 5).

Generalization from Findings

It is not the purpose of this paper to draw invidious comparisons between one form of instruction and another. It is sufficient to our purpose to show that self-instructional materials designed for the purpose of continuing professional adult education have an effectiveness that is documented, and possess the added versatility of use and

application that are so desirable when dealing with the busy professional.

We could go on to an extensive discussion of the 60 or more reported research studies dealing with programmed instruction in medical and nursing education in the United States and Great Britain alone (we do not mean to slight those in other countries, we simply have found ourselves challenged to keep abreast of those we find reports on most easily). It would be more practical and more conserving of the reader's time, however, to list the several generalizations that seem to have been well-established by now, each with one or more typical citations, and leave it to the interest and self-motivation of each learner to pursue the matter further.

1. Learning programs are definitely effective instructional devices in the teaching of medical subjects for advanced and continuing education. (Reinecke, 1967).

2. Learning programs are highly efficient instructional devices for the several areas and levels of the health fields. (Green, Weiss, and Nice, 1962).

3. Learning programs are accepted very positively by the learner and are regarded as valuable learning tools. (Eaton, et al., 1964).

4. Learning programs may be developed for a wide variety of learner outcomes including skills, techniques, and diagnostic judgment. (Wilds, 1965).

5. Programs have an inherent benefit in that their process of development raises questions about what is being taught to whom and why--questions that are so fundamental they are often overlooked. (Pierce, 1965).

In combination, these outcomes suggest that we have found a new and powerful tool to bring instruction to the practitioner at the point of relevance and impact, that we can count on that tool to be effective and efficient, and that we can further count on the tool to be accepted by the user.

The findings thus obtained have probable implication for any professional field that is beset by change, enforced pace of learning, and scarcity of instructional capacity. It is trite to observe that if learning programs can do these things for a profession like medicine then it is quite likely it could be effective in the development of instructional materials for many of the other occupational gooups that have been the more traditional focus of continuing education.

Let me add only one further quite personal observation on the use of programmed learning for continuing education. One of the most valued and effective premises on which programmed learning rests is the required involvement and participation of the learner. I sincerely believe that one reason for the success of programmed learning in health education is that it puts the responsibility for learning squarely on the shoulders of the learner--where it must ultimately rest anyway. What we are seeing then is the response of the person to that challenge and responsiblity. The results to date have been most gratifying, and of far reaching significance for all continuing and adult education.

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